

PATENT SPECIFICATION

(11) 1 440 084

34 (21) Application No. 43269/73 (22) Filed 14 Sept. 1973
(31) Convention

PATENTS ACT 1949

SPECIFICATION 1440084

In accordance with the Decision of the Superintending Examiner, acting for the Comptroller-General, dated 17 January 1980 this Specification has been amended under Section 14 in the following manner:

Page 1, Heading (54), *after* HYDRAULIC HOSE *insert* AND HOSE CLASP.
 Page 1, lines 9 and 84, Page 2, line 12, Page 3, lines 87 and 90, *after* hose *insert* and hose clasp
 Page 1, line 12, *after* therewith *insert*, the hose
 Page 1, line 50, *after* hose *insert* and hose clasp combination
 Page 1, line 53, *after* desired *insert* in the hose
 Page 1, line 55, *delete* a hydraulic hose for use in hydraulic *insert*, in combination, a hydraulic hose and hose clasp wherein the hose has a nominal internal diameter of 32 mm and comprises
 Page 1, *delete* lines 56 and 57
 Page 1, line 58, *delete* with, comprising
 Page 1, line 68, Page 3, line 86, *after* 1:1.5 *insert*, wherein the hose clasp comprises a nipple which can be inserted in the end of the hose and a sleeve surrounding the nipple which can be pressed on to the end of the hose, the sleeve having portions of reduced thickness which, when the sleeve is pressed on, are displaced outwardly of the sleeve by displacement of the hose material during pressing, wherein the portions of reduced thickness are provided in the vicinity of the ends of the sleeve, and wherein in the portion of the sleeve located between the reduced thickness portions the inner wall of the sleeve is provided with ribs which, when the sleeve is pressed, penetrate directly into the sheathing of the hose.
 Page 1, line 85, *after* wire *insert* in the hose
 Page 1, line 87, *delete* Moreover
 Page 1, *delete* lines 88 to 90, Page 2, *delete* line 1
 Page 2, lines 7 and 8, *after* thickness *insert* to the sheathing wall thickness in the hose and hose clasp
 Page 2, line 34, *for* with *read* of
 Page 2, line 35, *delete* according to the invention
 Page 2, *delete* lines 44 to 63
 Page 3, *delete* lines 73 to 76 *insert* 1. The combination of a hydraulic hose and hose clasp wherein the hose has a nominal internal diameter of 32mm and comprises a core made of an elas-
 Page 3, *delete* lines 94 to 111
 Page 3, *for* claim 5 *read* 4
 Page 3, line 113, *for* 4 *read* 1

THE PATENT OFFICE
9 May 1980

Bas 76319/3

EKKATA

Slip No 2

SPECIFICATION NO 1440084

Page 1, line 9, *for* hydraulic *read* hydraulic
 Page 1, line 42, *for* advantage *read* disadvantage
 Page 2, line 6, *for* amount *read* amounts *after* to *insert* between
 Page 2, line 10, *for* traditional *read* traditional
 Page 2, line 15, *for* hoses, *read* hoses,

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Bas 76742/1

SLIP No. 2

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PATENT SPECIFICATION

(11)

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F2G 24B5

(72) Inventors HORST HILDEBRANDT
JOHN S. HARNEVIOUS



(54) HYDRAULIC HOSE

(71) We, AEROQUIP G.m.b.H., a German Body Corporate of 1 Auefeld, Hann Münden 3510, Germany, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to a hydraulic hose for use in hydraulic systems of heavy machinery and able to withstand high pressures associated therewith comprising a hose core made of an elastomer, a sheathing comprising four layers of steel wire helically wound around the core in pairs, the pairs being wound in opposite directions, and a hose outer covering.

Hoses of this type are known which consist of a hose core generally made from an elastomer, for example from rubber, a sheathing surrounding the core and composed of two to four braided or coiled layers of steel wire, which are more or less closely bound together by thin intermediate layers of rubber, and an outer covering which again is normally made of rubber. While the core serves to conduct the medium carried in the hose, the sheathing is mainly responsible for withstanding the pressure of the medium. The sheathing also enables the hose to be retained in a hose fitting. The outer covering serves to protect the sheathing against mechanical damage and/or corrosion.

The sheathing of such a hose usually consists of layers of steel wire wound helically in pairs in opposite directions about the core of the hose. For particularly high pressures, six layers or three pairs of layers of steel wire are used. The more layers of wire the sheathing of the hose possesses, the more rigid it becomes. This is a considerable advantage for many applications in which a hose is desirable which is flexible within at least certain limits. On the other hand, there is the requirement for hoses to

withstand greater and greater pressures, especially hydraulic equipment in heavy machinery.

The aim of the invention, therefore, is to devise a hose which is able to withstand the high pressure associated with heavy machinery but which at the same time provides the flexibility desired.

According to the invention, there is provided a hydraulic hose for use in hydraulic systems of heavy machinery and able to withstand high pressures associated therewith, comprising a core made of an elastomer, a sheathing comprising four layers of steel wire helically wound around the core in pairs, the pairs being wound in opposite directions, and a hose outer covering, wherein the wall thickness of the core is substantially 2 mm and smaller than the wall thickness of the sheathing such that the ratio of the wall thickness of the core to the wall thickness of the sheathing is between 1:1.1 and 1:1.5.

This sort of sizing of a hydraulic hose leads to a comparatively low wall thickness of the elastomeric core and the diameter of the steel wire layers is also reduced. From this results the effect aimed at by the invention, the starting point being the recognition that with a reduction in the diameter of the sheathing, more favourable relationships prevail in respect to the stresses in the interior of the core compared to those at the surface of the sheathing. These relationships can be compared with a rigid pipe which with constant wall thickness withstands a much higher pressure the smaller the internal diameter.

With the hydraulic hose according to the invention, the number of layers of steel wire can be held to four, which leads to the retention of a sufficient flexibility. Moreover, for equal capacity to withstand pressure, the hose according to the invention has a smaller external diameter than hoses hitherto

SEE SEPARATE SLIP No. 2

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known and employed.

The relationships described above become clear in the following example. With traditional hoses, the ratio of wall thickness of the core to the wall thickness of the sheathing amount to 1:1.1 and 1:0.75. A particularly favourable ratio of hose core wall thickness according to the invention amounts to 1:1.5. The wall thickness of an elastomeric core with traditional hoses amounts — related to a nominal diameter of 32 mm — to usually 4 mm. In the hose according to the invention, the wall thickness is reduced to substantially 2 mm. With known hydraulic hoses, the starting point was evidently that a definite wall thickness is required for an elastomeric hose core in order to ensure embedding of the first layer of steel wire and to counteract cutting in of the wires of the sheathing on application of the sheathing. On the contrary, the invention proceeds from the recognition that the hose core simply has to fulfil the function of conducting the medium flowing through it. The core can therefore be kept to a low wall thickness of 2 mm for a nominal diameter of 32 mm.

Particularly favourable ratios are to be obtained in a preferred embodiment of the invention, in which a steel wire grain orientated by application of a tensile load is provided for the sheathing. A wire of this type is to be regarded with particular favour inasmuch as with it smaller bending radii of the steel wire layers with the hydraulic hose according to the invention are rendered possible.

In addition the preferred embodiment of the invention provides for the sheathing to consist of four layers of steel wire wound helically in pairs in opposite directions, and with regard to the outer covering of the hose, the ratio of core wall thickness to that of the outer covering amounts to 1:1.

According to another aspect of the invention, there is provided a combination of a hose according to the invention as previously defined and a hose clasp which comprises a nipple which can be inserted in the end of the hose and a sleeve surrounding the nipple which can be pressed on to the end of the hose, the sleeve having portions of reduced wall thickness which, when the sleeve is pressed on, are displaced outwardly of the sleeve by displacement of the hose material during pressing, wherein the portions of reduced wall thickness are provided in the vicinity of the ends of the sleeve and wherein in the portion of the sleeve located between the reduced wall thickness portions the inner wall of the sleeve is provided with ribs which, when the sleeve is pressed, can penetrate directly into the sheathing of the hose.

The combination of hose and hose clasp according to the invention will now

be further described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a partial section through one embodiment of a hose clasp in an unsqueezed state;

Figure 2 shows a hose clasp after introduction of the end of a hose and squeezing of the end with the hose clasp;

Figure 3 is a partial section through another embodiment of a hose clasp, before fitting, without a hose; and

Figure 4 shows the hose clasp illustrated in Figure 3 with a hose squeezed in it.

Referring to the drawings, the hose clasp illustrated in Figure 1 consists of an inner nipple 3a and an outer sleeve 5a. The sleeve 5a is pushed over the nipple 3a and a flange 7a in the sleeve engages in a recess 9a of the nipple. The sleeve 5a is thus secured axially in relation to the nipple 3a and is provided with two groove-shaped chambers 11a, 11a'. The groove-shaped chamber 11a serves as a seating for a resilient ring 13a and the groove-shaped chamber 11a', which has a greater axial length, accommodates three resilient rings 13a'. The three resilient rings 13a' can, however, also be combined into a single resilient ring having several, for example three, resilient coils.

A groove 17a is provided in the outer wall 15a of the sleeve 5a, said groove extending from near the end 19a into which the hose is inserted into the region of the sleeve in which the chamber 11a' is provided. The chamber 11a' flares out slightly to the end which is designed to receive the hose.

A number of ribs 21a are provided on the inner wall of sleeve 5a which are aligned with grooves 23a in the outer wall 25a of the nipple 3a. Furthermore, an annular flange 27a, which engages the resilient ring 13a with an oblique thrust surface 29a, is provided on the outer wall 25a of the nipple 3a.

The resilient rings 13a and 13a' are cut obliquely, as can be seen from Figure 1. When the sleeve 5a is squeezed, the resilient rings 13a and 13a' can thus be reduced in diameter, the ends 31a able to slide on one another in opposite directions.

The hose clasp shown in Figure 1 is designed to receive the end of a hose 33a (Figure 2) which consists of an inner core 35a, a wire sheathing 37a and an outer covering 39a. The end of the hose pushed into the clasp is stripped of the core from the flange 27a forwards. The outer covering is removed as far as the rear resilient rings 13a'.

When the hose clasp is squeezed, the ribs 21a are forced into the sheathing. The resilient ring 13a is reduced in diameter and the flange 27a is forced away from it towards the end 19a into which the hose was

inserted. In this way the core 35a is sealed off and the sheathing 37a is further secured against being pulled out of the hose clasp.

The portion of the sleeve reduced in wall thickness by the groove 17a is so thin as the result of this wall thickness reduction that displaced rubber material can arch this sleeve portion outwards, a chamber to take the displaced rubber material being thus created so that the sleeve does not increase in length. To improve sliding of the rubber a foil 41a can be added between the outer covering 39a and the sleeve which effects sliding of the rubber material in an axial direction in an optimum manner.

Figure 2 shows how the cut ends of each resilient ring 13a' slide against one another in the direction of the ring. The resilient rings preferably have a substantially circular cross-section as shown in Figures 1 and 2. It is, of course, possible to insert resilient rings with a different cross-section. The provision of cut ends in the resilient rings also has an influence on the connection produced. Preferably the cut ends will slope at a very sharp angle with respect to the spring wire.

The hose clasp illustrated in Figure 3 features a hose nipple 1 which is continued at one end to a screw closure beyond a flange 5. The inner wall 7 of the hose nipple is smooth so as to afford an undisturbed passage for the medium carried in the hose. The outer wall of the hose nipple is provided with a number of grooves 9.

A sleeve 11 is provided having a collar 13 for engagement with a groove 15 provided in the outer wall of the nipple 1, the sleeve being thereby secured axially with respect to the nipple 1. The sleeve is provided on its inner surface with annular ribs 17 in the region of a gripping zone A. The height of said ribs can be relatively high. On each side of the gripping zone A the sleeve is provided in its outer surface with grooves 19, 19'. The entire end of the sleeve to the right of the gripping zone A as viewed in Figure 3 is designated by the letter B.

One end of a hose 27 to be secured in the hose clasp is stripped in its foremost zone of both the outer covering 21 and the hose core 23. Only the sheathing 25, consisting of steel wire, extends, therefore, up to the collar 13 of sleeve 11. The outer covering 21 is removed up to the gripping zone A.

After pushing in the hose 27 between the nipple 1 and the sleeve 11, the sleeve is pressed hydraulically against the hose 27 and nipple 1. The hydraulic pressure is thereby exerted on the inwardly situated end 29 of the sleeve and the gripping zone A. The ribs 17 are thus forced into the sheathing 25

of hose 27. This produces an intimate contact between the sleeve 11 and sheathing 25. The rubber of the hose core 23 in the region of the gripping zone A, with the sleeve being pressed, is displaced to the right and to the left in cold flow and arches the sleeve outwardly in the region of grooves 19 and 19'. The archings 31, 31' can be seen clearly in Figure 4.

WHAT WE CLAIM IS:—

1. A hydraulic hose for use in hydraulic systems of heavy machinery and able to withstand high pressures associated therewith, comprising a core made of an elastomer, a sheathing comprising four layers of steel wire helically wound around the core in pairs, the pairs being wound in opposite directions, and a hose outer covering, wherein the wall thickness of the core is substantially 2 mm and smaller than the wall thickness of the sheathing such that the ratio of the wall thickness of the core to the wall thickness of the sheathing is between 1:1.1 and 1:1.5.

2. A hose according to claim 1, wherein a grain orientated steel wire is used for the sheathing.

3. A hose according to claim 1 or claim 2, wherein the ratio of the core wall thickness to the outer covering wall thickness is 1:1.

4. The combination of a hose according to any one of claims 1 to 3, with a hose clamp which comprises a nipple which can be inserted in the end of the hose and a sleeve surrounding the nipple which can be pressed on to the end of the hose, the sleeve having portions of reduced thickness which, when the sleeve is pressed on, are displaced outwardly of the sleeve by displacement of the hose material during pressing, wherein the portions of reduced thickness are provided in the vicinity of the ends of the sleeve and wherein in the portion of the sleeve located between the reduced thickness portions the inner wall of the sleeve is provided with ribs which, when the sleeve is pressed, can penetrate directly into the sheathing of the hose.

5. The combination of the hose and hose clamp claimed in claim 4, substantially as hereinbefore described with reference to the accompanying drawings.

ARTHUR R. DAVIES
Chartered Patent Agents,
27, Imperial Square,
Cheltenham.

— and —
115, High Holborn,
London, W.C.1.
Agents for the Applicants.

Fig.1

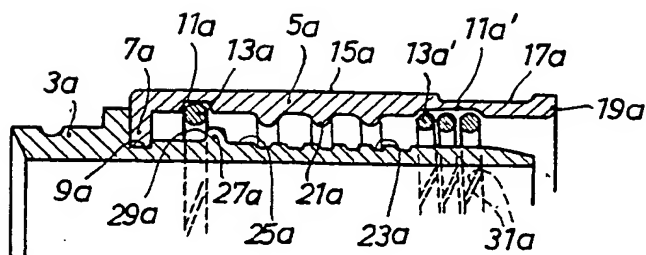


Fig.2

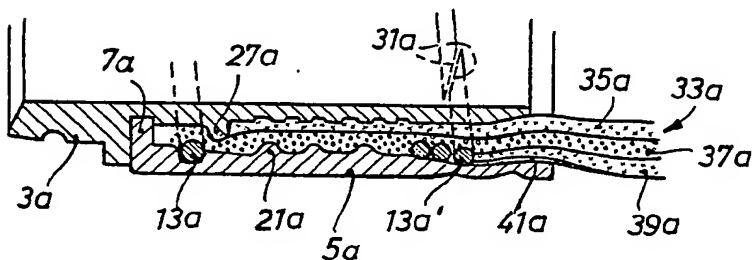


Fig.3

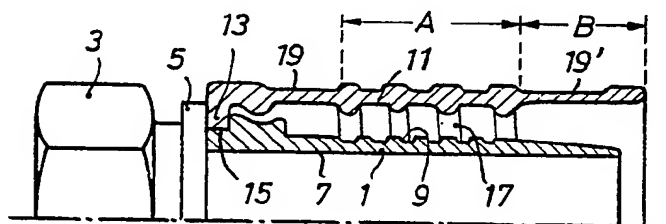


Fig.4

